Navy Environmental & Preventive Medicine Unit No. 2
1887 Powhatan St.
Norfolk, VA 23511-3394
(757) 444-7671

02 October 2001

Medical Force Protection: Nicaragua

Medical Force Protection countermeasures required before, during, and after deployment to the "area" are as follows:

Major Threats

Diarrhea, respiratory diseases, injuries, hepatitis A, dengue fever, leptospirosis, rabies, brucellosis, malaria, other arthropod-borne infections, sexually transmitted diseases, heat injury, and Chaga's disease. Water may be contaminated by raw sewage, industrial wastes, agrochemicals, and salt water intrusion.

Requirements before Deployment

1. **Before Deploying report to Medical to:**
   a. Ensure your Immunizations are up to date, specific immunizations needed for area: **Hepatitis A, MMR, Polio, Typhoid, Yellow fever, Tetanus (Td), and Influenza.**
   b. If you have not been immunized against Hepatitis A (two dose series over 6 months) get an injection of Immunoglobulin with the initial Hepatitis A dose.
2. **Malaria Chemoprophylaxis:**

Must include Primaquine terminal prophylaxis (see "Requirements after deployment")

   a. Chloroquine 500 mg/week 2 weeks prior to entering Belize, and until 4 weeks after departure.
   b. Mefloquine 250 mg/week 2 weeks prior to entering Belize, until 4 weeks after departure
   c. Doxycycline 100 mg/day 2 days prior to entering country, until 4 weeks after departure.

3. **Get HIV testing if not done in the past 12 months.**
4. **Make sure you have or are issued from unit supply: DEET, permethrin, bednets/poles, sunscreen and lip balm. Treat utility uniform and bednet with permethrin.**

Requirements during Deployment

1. Consume food, water, and ice only from US-approved sources; **"Boil it, cook it, peel it, or forget it"**.
2. Involve preventive medicine personnel with troop campsite selection.
3. Practice good personal hygiene, hand-washing, and waste disposal.
4. Avoid sexual contact. If sexually active, use condoms.
5. Use DEET and other personal protective measures against insects and other arthropod-borne diseases. Personal protective measures include but are not limited to proper wear of uniform, use of bed nets, and daily "buddy checks" in tick and mite infested areas.
6. Minimize non-battle injuries by ensuring safety measures are followed. Precautions include hearing and eye protection, enough water consumption, suitable work/rest cycles, acclimatization to environment and stress management.
7. Eliminate food/waste sources that attract pests in living areas.
8. Avoid contact with animals and hazardous plants.

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Requirements after Deployment

1. Receive preventive medicine debriefing after deployment.
2. Seek medical care immediately if ill, especially with fever.
3. Get HIV and PPD testing as required by your medical department or Task Force Surgeon.
4. Malaria terminal prophylaxis: Primaquine 15 mg/day beginning on day of departure from Belize for 14 days unless G-6 PD deficient

NICARAGUA
VECTOR RISK ASSESSMENT PROFILE
(VECTRAP)

Prepared by: **Navy Disease Vector Ecology and Control Center**
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1. GEOGRAPHY: **Area** - 148,000 sq. km. (57,000 sq. mi.); about the size of Iowa. **Cities - *Capital*** - Managua (pop 1 million) . ***Other cities*** -Leon, Granada, Jinotega, Matagalpa, Chinandega, Masaya. **Terrain** - Coastal plain leading to rugged mountains which descend to forested plains and hills. The swampy eastern plains extend 40-50 miles inland. **Climate** - Tropical.

2. VECTOR-BORNE DISEASES:

a. **MALARIA:** Risk is year-round; risk reportedly is elevated from May through December, but vector populations are highest from November through March. *Plasmodium vivax* and *P. falciparum* are present country-wide. *Plasmodium vivax* accounts for more than 90% of the cases, with *P. falciparum* accounting for the remainder of the cases. Risk is country-wide at elevations below 1,000 meters, except for the centers of major urban areas such as Managua and Leon. During the 1980s, official annual case totals generally had varied from 15,000 to 18,000, (33,000 in 1988). Recently, overall levels are increased; the 59,000 cases reported during 1995 represented an all time high, and incidence during early 1996 reportedly exceeded that reported during the comparable period of 1995. No cases of chloroquine- or fansidar-resistant *P. falciparum* have been reported. The risk of acquiring malaria is considered high without the proper chemoprophylaxis and would result in a serious loss of combat effectiveness.

b. **DENGUE FEVER:** Risk from dengue fever/dengue hemorrhagic fever/dengue shock syndrome (DF/- DHF/DSS) may be elevated because all four serotypes likely circulate. Risk is year-round in urban areas. In the latter part of 1994, Nicara- gua experienced a country-wide dengue epidemic. During 1994/95, more than 30,000 cases of dengue were reported, with more than 1,500 cases of DHF/DSS. Once acquired, dengue would cause a serious loss to combat effectiveness.

c. **Cutaneous Leishmaniasis** is present country-wide at moderate levels of endemicity in the rural areas. Most cases are reported from the northern and eastern regions, and are often associated with forest edges and rural settlements. Most cases reported have been cutaneous, presumably caused by *Leishmania braziliensis* or *L. mexicana*. Approximately 8 percent of cases seen have some mucosal involvement. The occurrence of visceral leishmaniasis (VL) (likely caused by *Leishmania chagasi*) in Nicaragua recently was confirmed in a northwestern area near Honduras.
Leishmaniasis would not pose a serious threat to combat effectiveness.

d. **Trypanosomiasis:** American trypanosomiasis (**Chagas'** disease) occurs in Atlantic coastal, western, and central rural areas under 1,500 meters elevation. Chagas' disease is present country-wide at low levels of endemicity in the rural areas.
OTHER THREATS:

Leptospirosis: An outbreak in 1995 resulted in over 2,000 cases and 26 deaths. Reservoirs include wild and domestic animals, especially rats, cattle, swine, and dogs. Transmission occurs by direct contact with infected tissues or urine, or indirectly by contact with urine-contaminated water, food, moist soil or vegetation.

3. DISEASE VECTOR INFORMATION

a. The primary vector of malaria is the mosquito *Anopheles albimanus*. *An. pseudopunctipennis* is a secondary vector.

An. albimanus predominates in coastal areas where larval sites include fresh and brackish water, unshaded pools, lakes, and lagoons. Diurnal resting sites are variable but favor man-made structures. It prefers to feed on ungulates, but will opportunistically feed on humans, preferring the ankle area. This mosquito is reported to be resistant to the insecticides DDT, dieldrin, lindane, fenitrothion, malathion, chlorphoxim and propoxur.
An. pseudopunctipennis is found in many of the same habitats as *An. albimanus* with either species being dominant, however, *An. pseudopunctipennis* predominates in highland valleys. It breeds in shallow pools, seepages, and drying riverbeds and is a persistent indoor feeder on humans. It does not rest indoors prior to, or after, feeding on humans - therefore residuals are ineffective. It is not attracted to light traps. Barrier treatments out to 100m should be effective.
An. pseudopunctipennis is resistant to dieldrin and lindane.

b. Dengue fever is transmitted by *Aedes aegypti*. This is a peridomestic mosquito that prefers to breed in artificial containers near human habitations. It is diurnally (i.e., daytime) active and feeds indoors or out, often biting around the neck or ankles. It typically rests indoors after feeding.

c. The main vectors of Chagas' disease are the reduviid bugs, *Rhodnius prolixus* and *Triatoma dimidiata*. Reduviids are also referred to as kissing bugs, conenose bugs, or triatome bugs.
These insects are often found in thatched-roofed huts and earthen-floored habitations, and are associated with woodpiles and stored clothing. Risks of being bit are higher when sleeping in these areas and/or in close contact with the ground. Feeding occurs at night. The face and surrounding areas of exposed skin are favored feeding sites. Disease pathogens are transmitted by rubbing bug feces into wound sites produced by the feeding insects.

d. Sand flies, *Lutzomyia* spp., are the vectors of leishmaniasis. Most sand flies are active between dusk and dawn and have very limited flight ranges. At least five species have been implicated as vectors in Nicaragua.

4. DISEASE AND VECTOR CONTROL PROGRAMS:

a. Malaria chemoprophylaxis should be mandatory. Consult the Navy Environmental Preventive Medicine Unit #2 in Norfolk, VA (COMM: 804-444-7671; DSN: 564-7671; FAX: 804-444-1191; PLAD: NAVENPVNTMEDU TWO NORFOLK VA) for the current chemoprophylaxis recommendations.

b. Yellow fever immunizations should be current.

c. The conscientious use of personal protective measures will help to reduce the risk of many vector-borne diseases. The most important personal protection measures include the use of DEET insect repellent on exposed skin, wearing permethrin-treated uniforms, and wearing these uniforms properly. The use of DEET 33% lotion (2 oz. tubes: NSN 6840-01-284-3982) during daylight and evening/night hours is recommended for protection against a variety of arthropods including mosquitoes, sand flies, other biting flies, fleas, ticks and

mites. Uniforms should be treated with 0.5% permethrin aerosol clothing repellent (NSN 6840-01-278-1336), per label instructions. NOTE: This spray is only to be applied to trousers and blouse, not to socks, undergarments or covers. Reducing exposed skin (e.g., rolling shirt sleeves down, buttoning collar of blouse, blousing trousers) will provide fewer opportunities for blood-feeding insects and other arthropods. Additional protection from mosquitoes and other biting flies can be accomplished by the use of screened eating and sleeping quarters, and by limiting the amount of outside activity during the evening/night hours when possible. Bednets (insect bar [netting]: NSN 7210-00-266-9736) may be treated with permethrin for additional protection.

d. The malaria vector *An. albimanus* is not as affected by repellents as most other mosquito species. However, repellents should still be used because they provide some degree of protection.

e. The most important element of an *Aedes aegypti* control program is SOURCE REDUCTION. Eliminating or covering all water holding containers in areas close to human habitation will greatly reduce *A. aegypti* populations. Alternatively, containers may be emptied of water at least once a week to interrupt mosquito breeding. Sand or mortar can be used to fill tree holes and rock holes near encampments.

f. Control of reduviid bugs is based upon removal of debris and harborage, applying residual wettable powders to wall surfaces, and insect harborages, and use of bednets. Avoidance of infested habitations is the best prevention.

g. Because the breeding habitats of most sand fly species are not easily identified, not easily accessible, or unknown, control strategies focus mainly on adult sand flies. Peridomestic sand fly species can be controlled by spraying residual insecticides on buildings (including screening on portals of entry) animal shelters, and other adult resting sites. Area chemical control of sylvan sand fly species is impractical. Personal protective measures will reduce sand fly bites and environmental modification (e.g., clearing forests, eliminating rodent burrows/breeding sites, relocating domestic animals away from human dwellings) has been used to reduce local sand fly populations.

g. Expanded Vector Control Recommendations are available upon request.

5. IMPORTANT REFERENCES:

Contingency Pest Management Pocket Guide - Fourth Edition. Technical Information Memorandum (TIM) 24. Available from the Defense Pest Management Information Analysis Center (DPMIAC) (DSN: 295-7479 COMM: (301) 295-7479). Best source for information on vector control equipment, supplies, and use in contingency situations.

Control of Communicable Diseases Manual - Sixteenth Edition. 1995. Edited by A. S. Benenson. Available to government agencies through the Government Printing Office. Published by the American Public Health Association. Excellent source of information on communicable diseases.

Medical Environmental Disease Intelligence and Countermeasures - (MEDIC). September 1997. Available on CD-ROM from Armed Forces Medical Intelligence Center, Fort Detrick, Frederick, MD 21702-5004. A comprehensive medical intelligence product that includes portions of the references listed above and a wealth of additional preventive medicine information.

Internet Sites- Additional information regarding the current status of vector-borne diseases in this and other countries may be found by subscribing to various medical information sites on the internet. At the Centers of Disease Control and Prevention home page subscriptions can be made to the Morbidity and Mortality Weekly

Report(MMWR)and the Journal of Emerging Infectious Diseases. The address is www.cdc.gov. The World Health Organization Weekly Epidemiology Report (WHO-WER) can be subscribed to at www.who.int/wer. The web site for PROMED is www.promedmail.org:8080/promed/promed.folder.home.
Although PROMED is not peer reviewed, it is timely and contains potentially useful information. The CDC and WHO reports are peer reviewed. Information on venomous arthropods such as scorpions and spiders as well as snakes, fish and other land animals can be found at the International Venom and Toxin Database website at www.uq.edu.au/~ddbfry/. Information on anti-venom sources can also be found at that site. Information on Poisonings, Bites and Envenomization as well as poison control resources can be found at www.invivo.net/bg/poison2.html.